

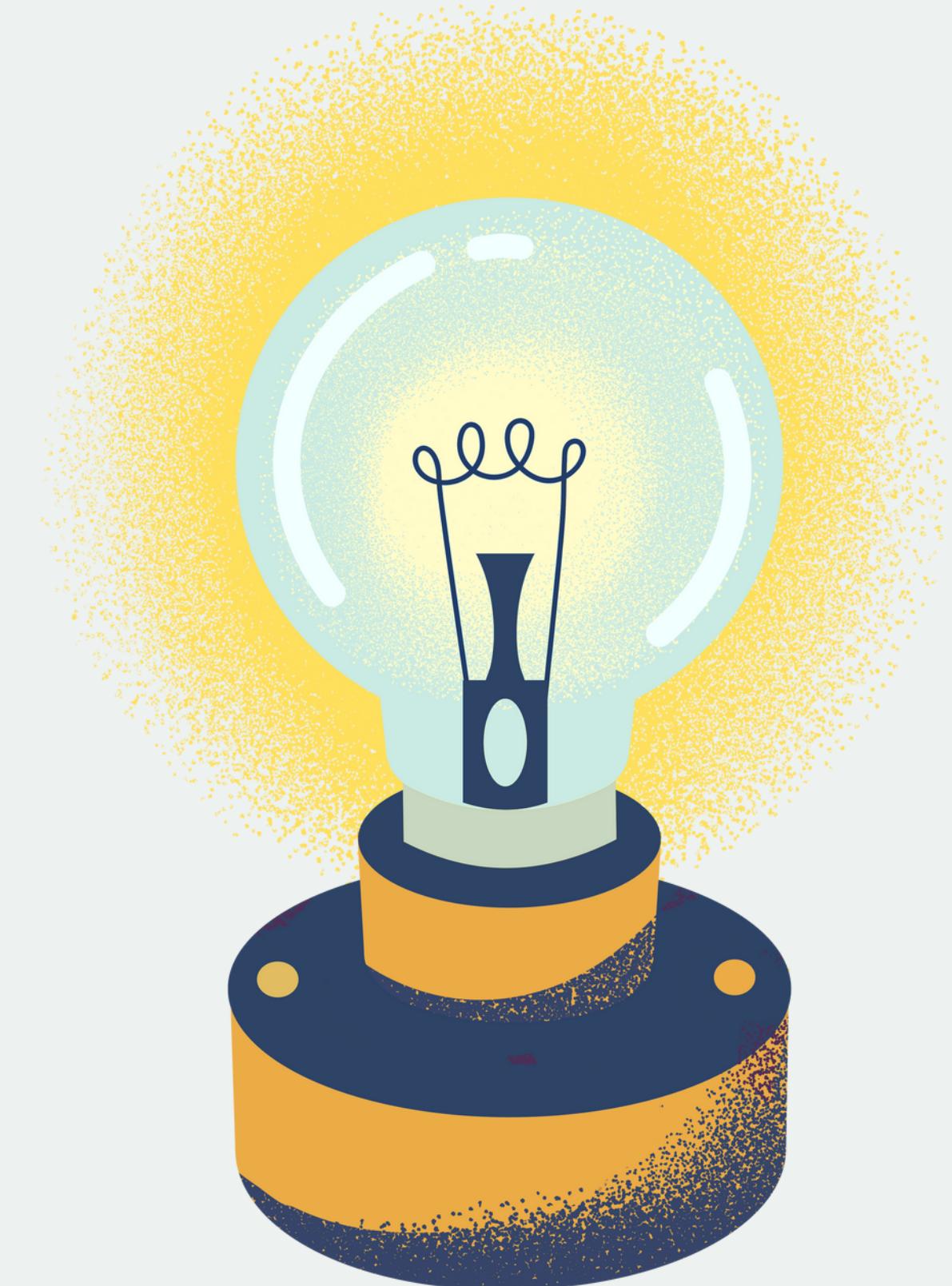


By: Team 15

Renewable energies

Comprehensive Analysis of Clean Energy
Production Across Europe

Big Data Final



Introduction: The urgency to act on climate change

The global energy landscape has undergone significant changes, especially post-Russia's invasion of Ukraine, accelerating the EU's shift towards renewable energy sources.

The European Union, who has historically relied on fossil fuel imports from Russia, is in dire of widespread adoption of renewable energy technologies.

By exploring geographical distributions, technological trends, and other features within the dataset we provide institutions at stake the appropriate insights for strategic decision-making

PROJECT OBJECTIVE

The project aims to provide insights for strategic site selection, forecasting future energy demand and trends, and market entry strategy for renewable energy companies

Primary Renewable Energies

Bioenergy

Derived from organic materials, such as plants, animal waste, and wood.

Solar

Harnessed from the sun, and produces no greenhouse gases during production.

Wind

Generated by converting wind currents into electricity using wind turbines.

Geothermal

Derived from natural heat of the earth, and is prevalent in areas with volcanic activity.

Hydro

Produced from harnessing the energy of moving water, typically in the form of dams.

Marine

Harnessing energy of tidal currents and energy of surface waves.



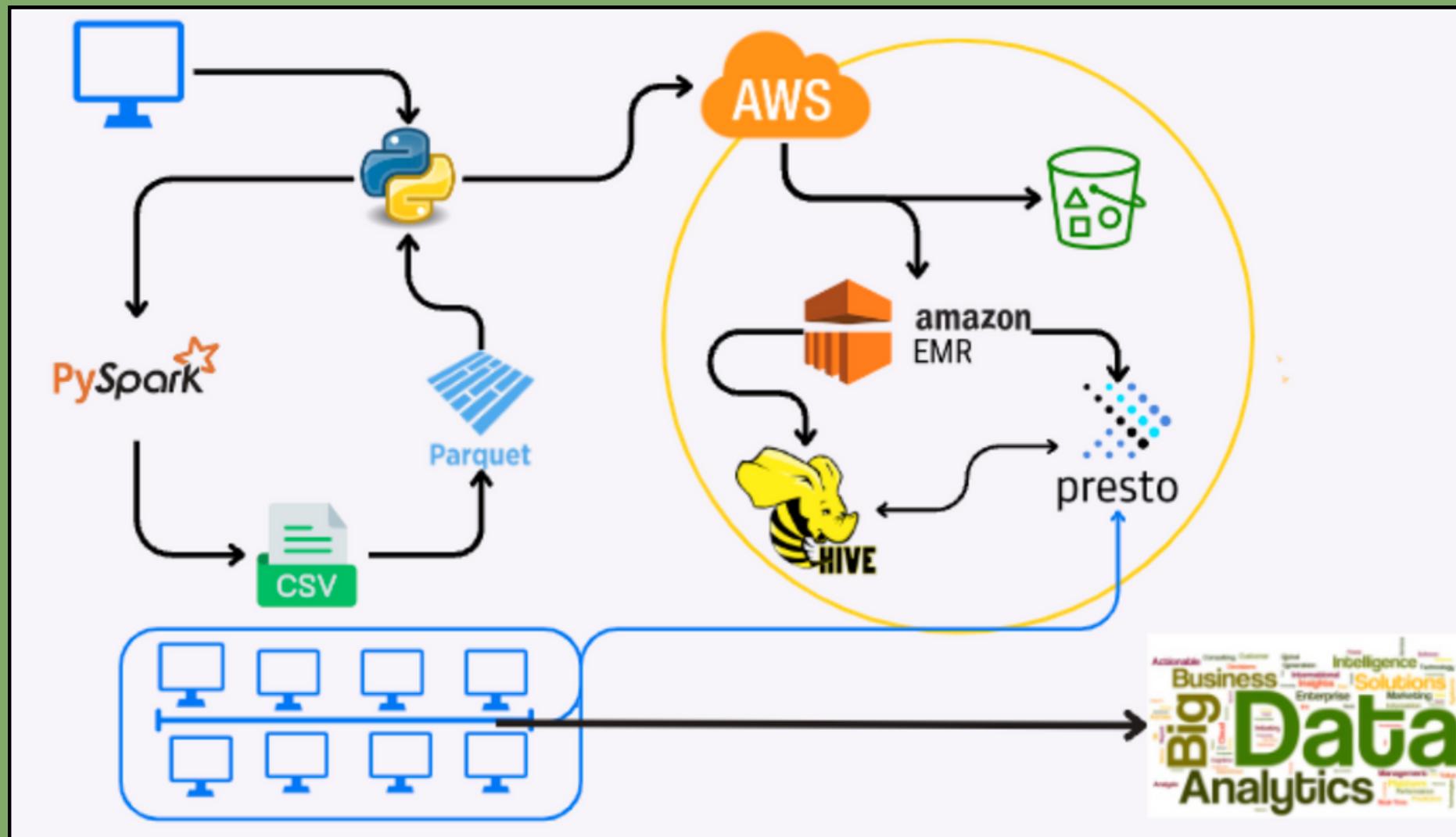
Imagine this Scenario...

A team of analysts is tasked with analyzing data about renewable energy capacity across Europe. However, the collection of datasets is comprised of 11 files with a total of 4.13 M rows. The files are exceedingly large and decentralized, meaning it is not ideal for each analyst to load the files into computer memory.

What can the analysts do?



Project's Data Model



01.

Data ingestion is performed using Python to interact with the AWS console. CSV files containing information on renewable energy are converted into Parquet and stored within S3

02.

Using Python's Boto3 library, an EMR cluster is created in order to upload the Parquet files into Hive's metastore

03.

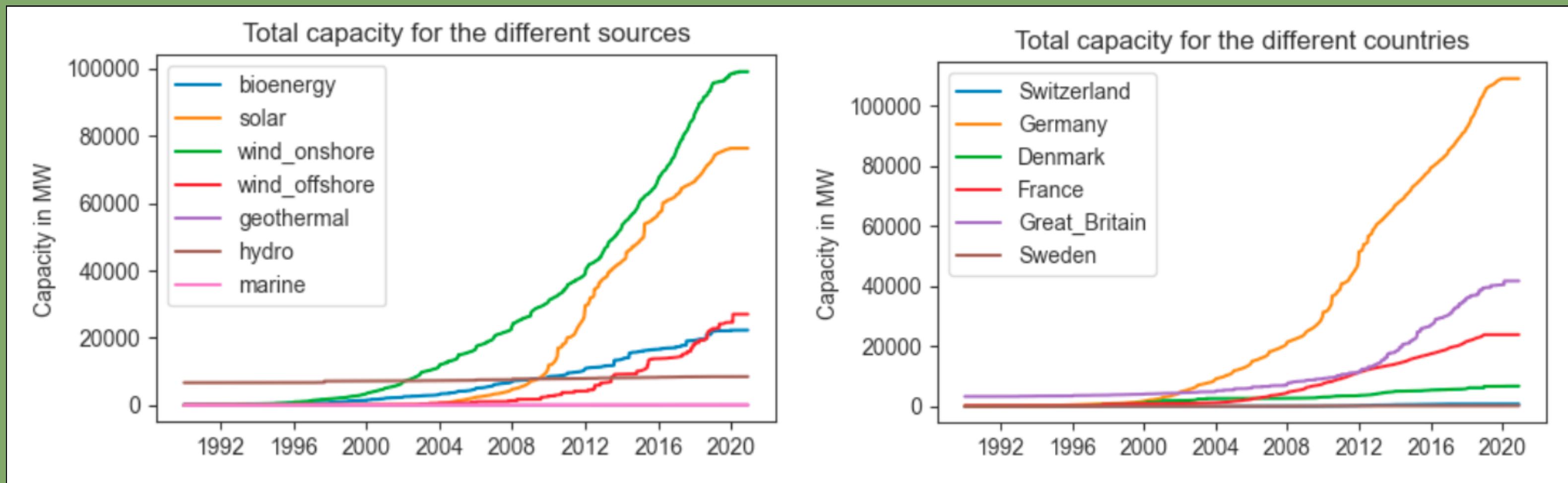
Finally, a Presto connection string is created in order to make the data readily available for analysis and applications of renewable energy across Europe

Source Uptake Over Time

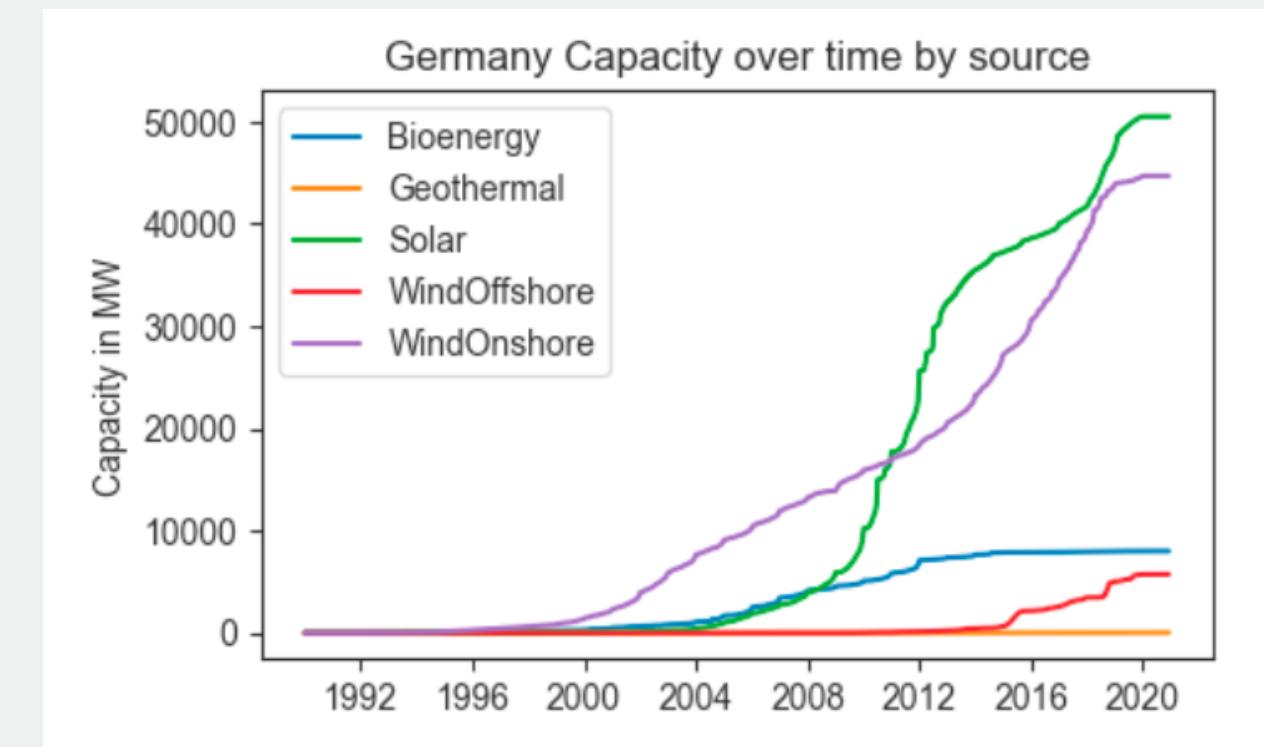
Once the Presto connection has been established, we utilize the software in order to perform exploratory data analysis on our collection of data.

From our analysis, onshore wind energy has been the renewable energy with the highest historical rate of adoption. On the other hand, offshore wind energy has rapidly increased in recent years, signaling a rise in outsourcing capacity.

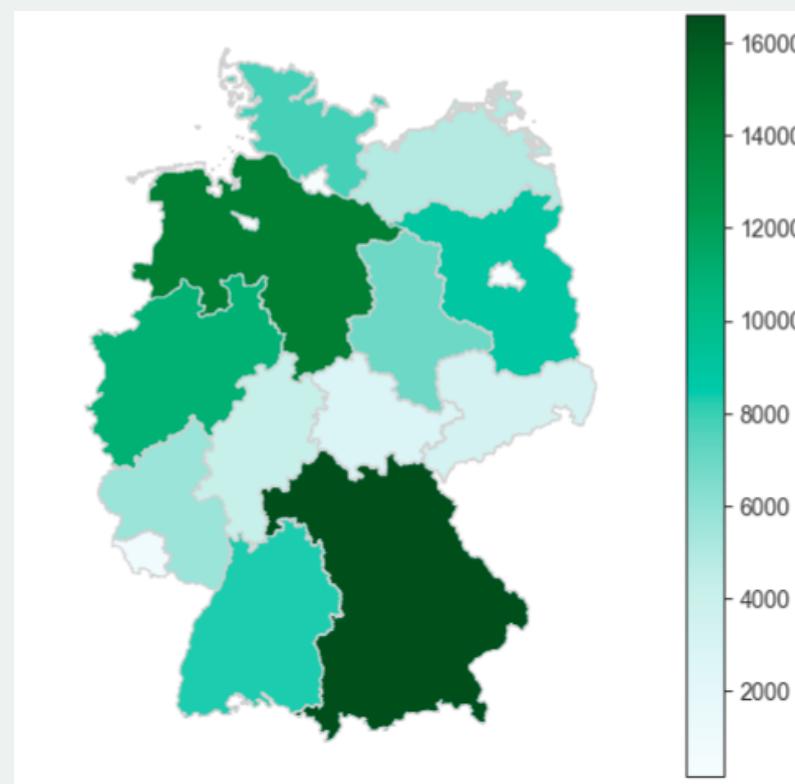
In the context of capacity and production, Germany has had the highest level of renewable energy adoption over time. Thus, Germany is an attractive market for potential firms.



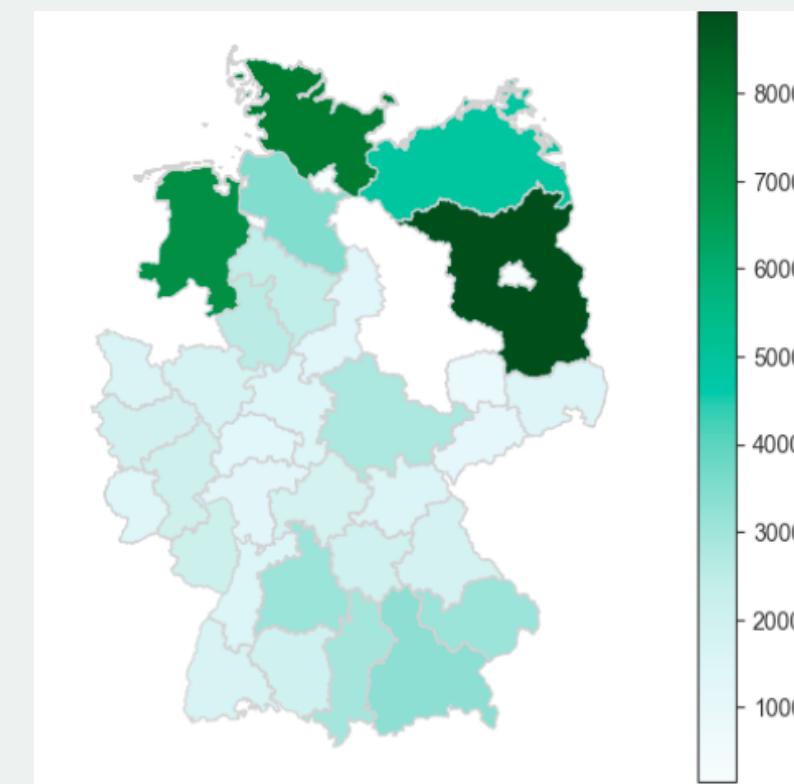
Further Analysis: Germany



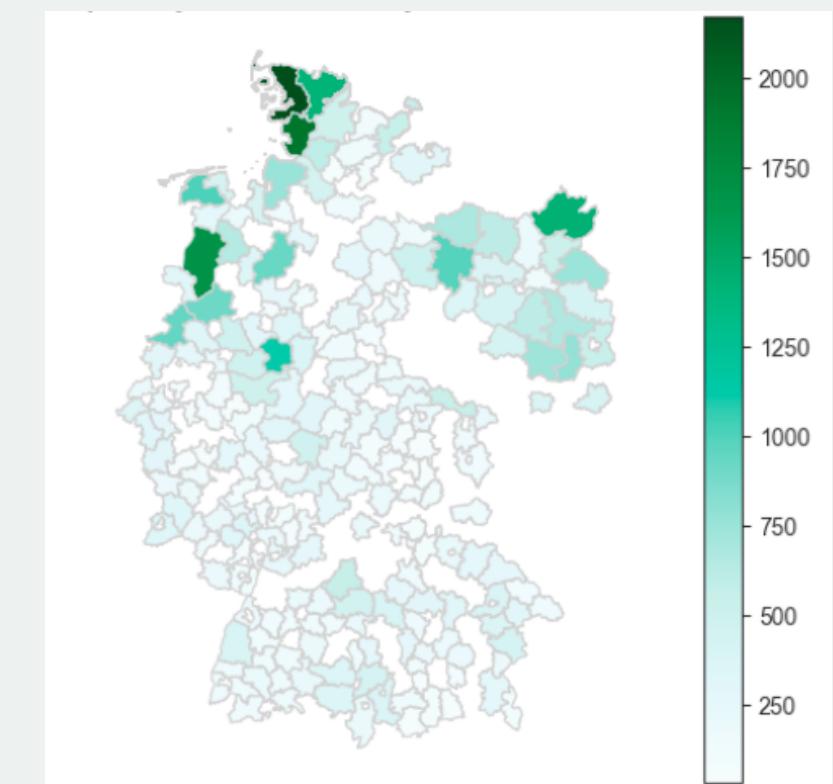
NUTS 1: States



NUTS 2: Regions



NUTS 3: Districts

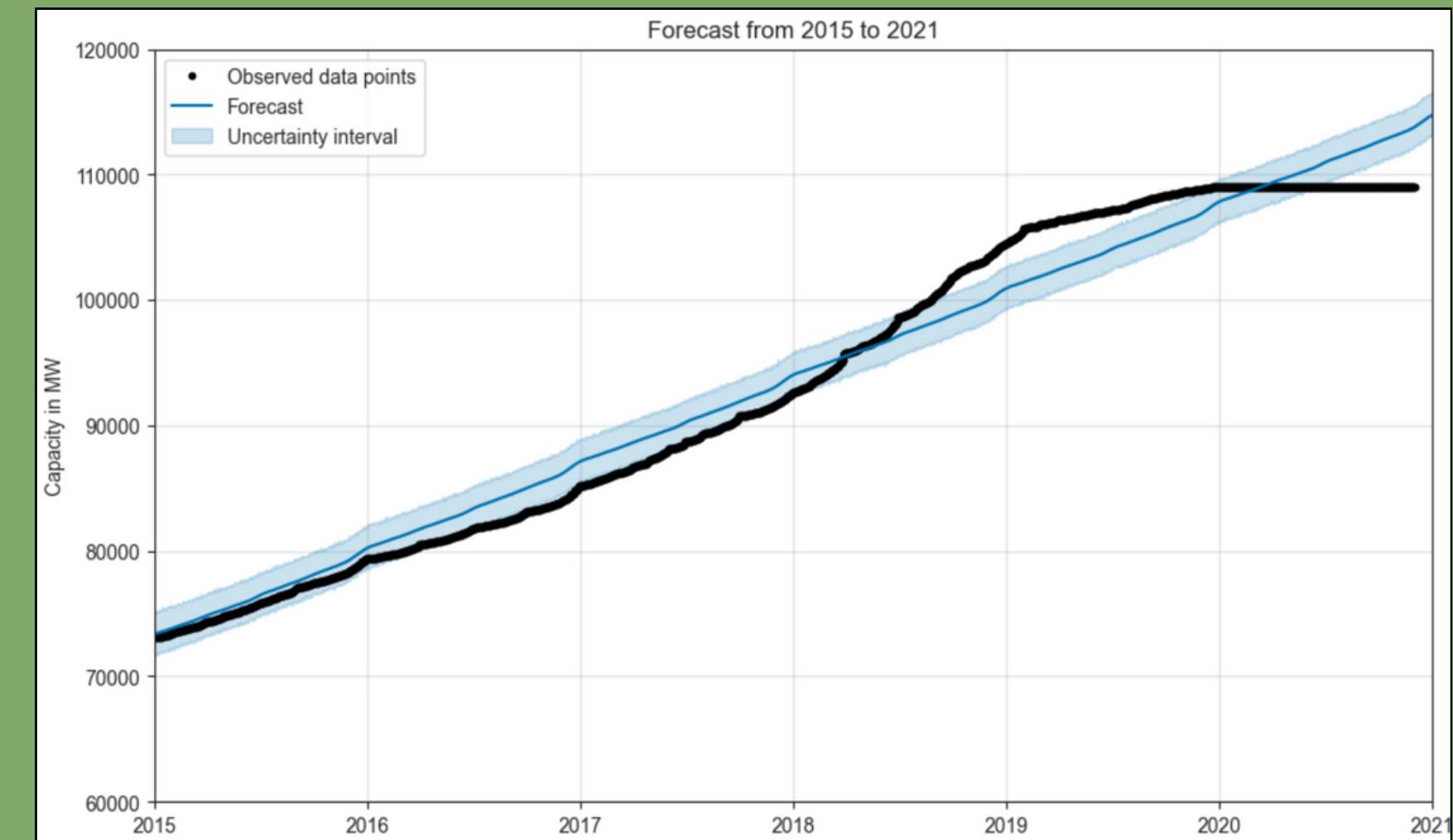
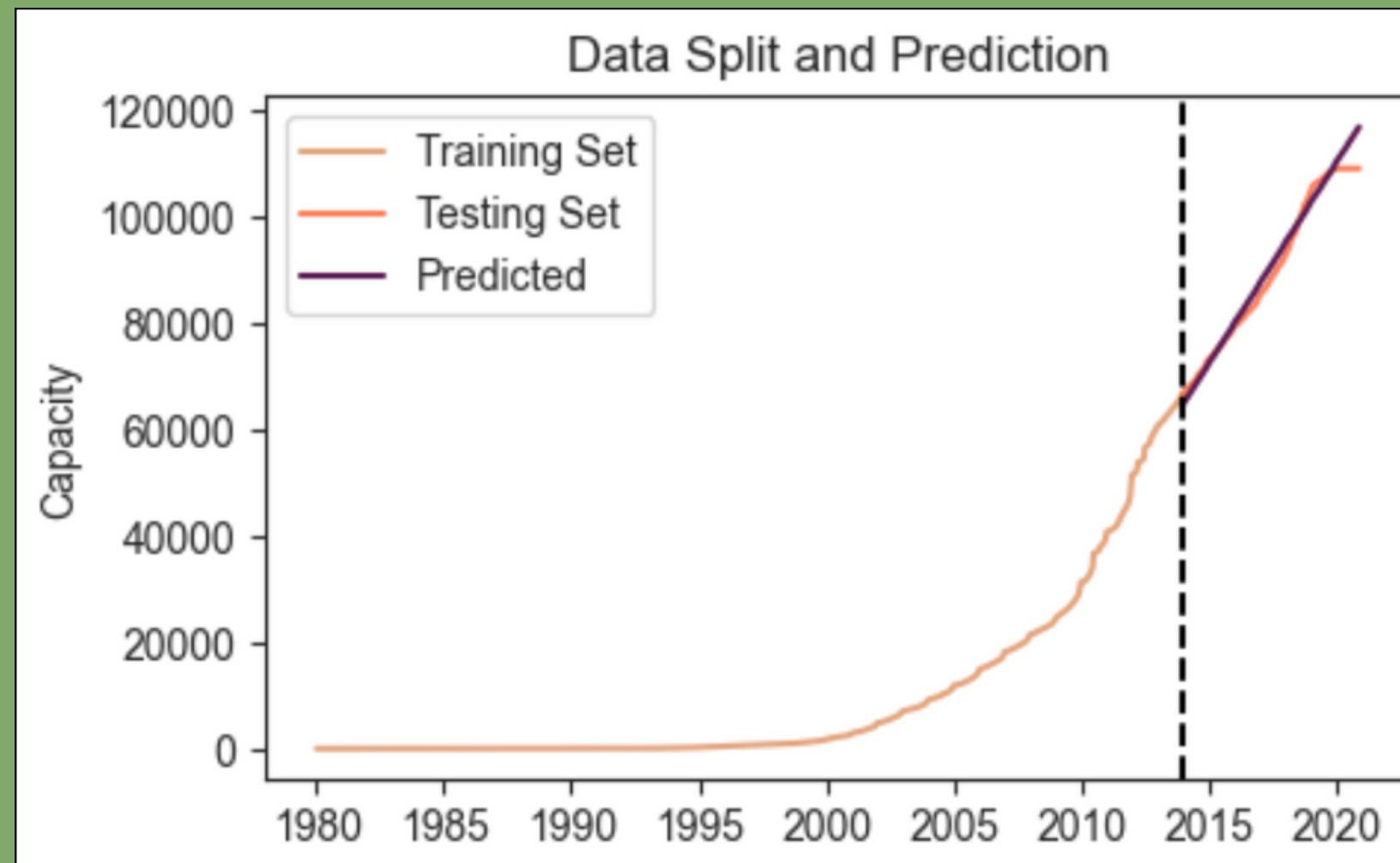


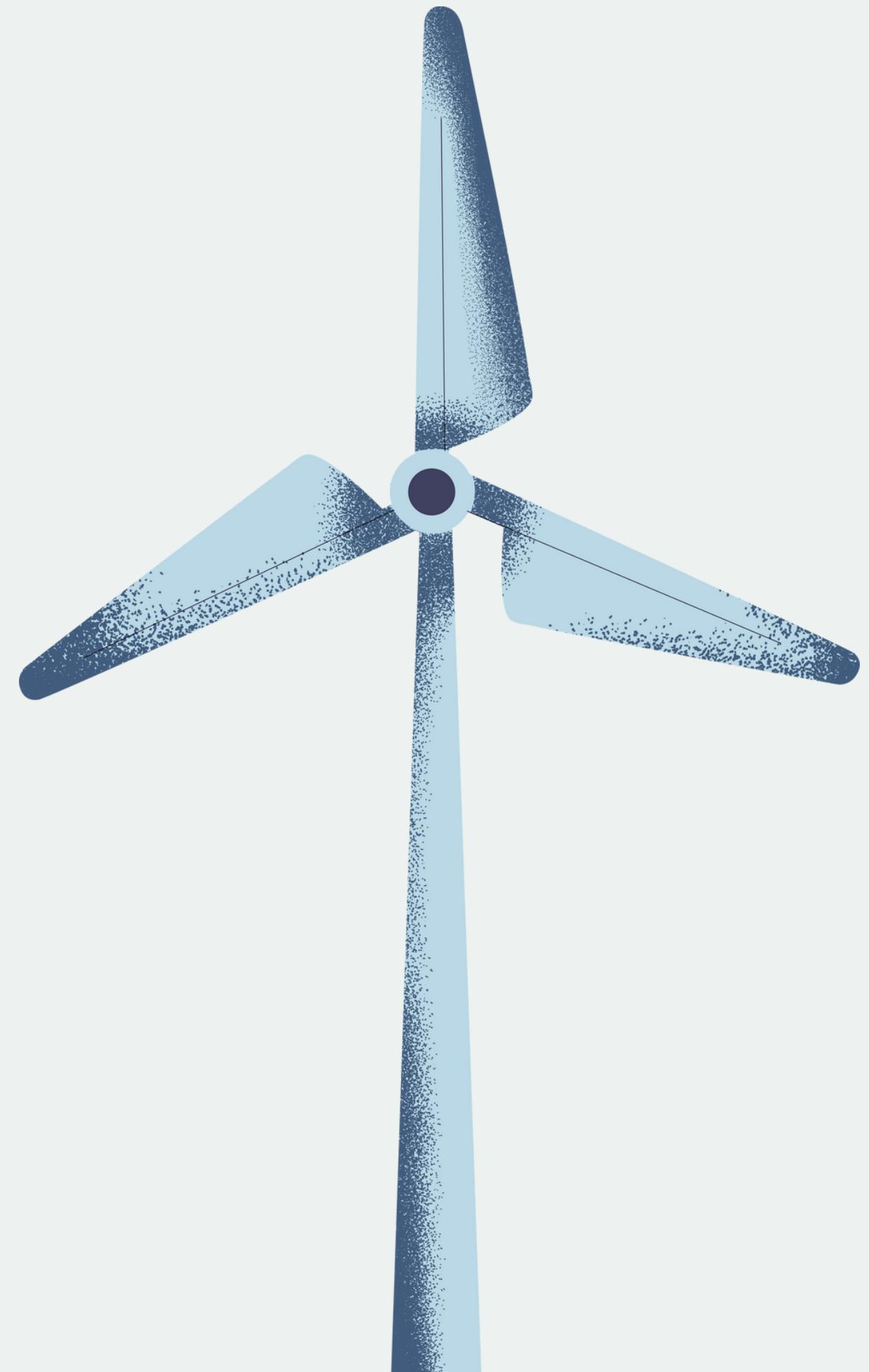
~2%

Mean Average Percent Error: Forecasting Model for Energy Capacity

Using our data pipeline implemented through Python, we have utilized Meta's open source Prophet library to create a forecast for renewable energy production.

The aim of using this predictive model is to forecast what trends may look like for future investors to invest more capital and resources into clean energy alternatives





Who Benefits from Adoption?

General Population

Transitioning away from Russian fossil fuel imports to renewable energies implies higher up-front costs to adopt these sources of energy but long-term benefits in the form of achieving sustainability goals. Furthermore, the reduction of fossil fuel consumption ensures lower long-term annual cost of energy to the European citizen.

Renewable Energy Firms

Widespread adoption of renewable energy across Europe opens a market for rapid innovation for firms seeking to invest in the development and implementation of renewable energies.



Thank you very much!



Jean-
Baptiste



Sonali



Chuma



Lanston



Francis